CLAIMS

What is claimed as new and desired to be protected by Letters Patent of the United States is:

1. A semiconductor module, comprising:

a dielectric flex tape substrate having a first tape surface, a second tape surface, an end, a plurality of tape terminal pads on the first tape surface, and a plurality of traces, each trace electrically connecting to a respective one of the tape terminal pads on the first tape surface of the tape substrate; and

a semiconductor die having a first die surface, a second die surface, an edge, and a plurality of die attach pads on the first die surface adjacent the edge, the semiconductor die being attached to and overlapping the end of the tape substrate and having electrical connections between the die attach pads and respective tape terminal pads.

2. The semiconductor module of claim 1, wherein the semiconductor die contains an array of pixels.

3. The semiconductor module of claim 2, further comprising a lens structure disposed over the array of pixels.

4. The semiconductor module of claim 3, wherein the lens structure is disposed on the array of pixels.

5. The semiconductor module of claim 2, wherein the pixel array includes CMOS pixels.

6. The semiconductor module of claim 2, further comprising a cover glass over the pixel array.

7. The semiconductor module of claim 6, wherein the cover glass is an infrared cut filter.

8. The semiconductor module of claim 6, wherein the cover glass is adhered directly to the die.

9. The semiconductor module of claim 6, further comprising a lens structure disposed over the cover glass.

10. The semiconductor module of claim 6, further comprising a lens holder disposed over the cover glass.

11. The semiconductor module of claim 10, wherein the lens holder is disposed on the cover glass.

12. The semiconductor module of claim 2, further comprising a lens holder disposed over the pixel array.

13. The semiconductor module of claim 1, wherein the edge is an only one of a plurality of edges having die attach pads.

14. The semiconductor module of claim 1, further comprising an encapsulant applied to the electrical connections between the die attach pads and the respective tape terminal pads.

15. The semiconductor module of claim 1, wherein the tape substrate partially overlaps the first die surface.

16. The semiconductor module of claim 15, wherein the electrical connections are made using solder bumps.

17. The semiconductor module of claim 16, wherein the electrical connections are made by using a reflow process.

18. The semiconductor module of claim 16, wherein the electrical connections are made using tape automated bonding.

19. The semiconductor module of claim 16, wherein the electrical connections are made using anisotropic conductive film.

20. The semiconductor module of claim 16, further comprising an encapsulant underfill applied to the electrical connections between the die attach pads and the respective tape terminal pads.

21. The semiconductor module of claim 1, wherein the tape substrate at least partially overlaps the second die surface.

22. The semiconductor module of claim 21, wherein the electrical connections are made using wire bonding.

23. A camera module, comprising:

a dielectric flex tape substrate having a first tape surface, a second tape surface, an end, a plurality of tape terminal pads on the first tape surface near the end of the tape substrate, and a plurality of traces, each trace electrically connecting to a respective one of the terminal pads;

a semiconductor die having a pixel array, a first die surface, a second die surface, an edge, and a plurality of die attach pads on the first die surface adjacent the edge, the semiconductor die being attached to and overlapping the end of the tape substrate and having electrical connections between die attach pads and respective tape terminal pads; and

a lens structure disposed over the pixel array.

24. The camera module of claim 23, further comprising a cover glass disposed between the lens structure and the pixel array.

25. The camera module of claim 23, wherein the pixel array includes CMOS pixels.

26. The camera module of claim 23, wherein the pixel array includes CCD pixels.

27. The camera module of claim 23, wherein said electrical connections are formed by wire bonds.

28. The camera module of claim 23, wherein said electrical connections are formed by solder bumps.

29. The camera module of claim 23, further comprising an infrared lens formed over said semiconductor die.

30. An imaging apparatus comprising:

a processor; and

a camera module electrically connected to the processor, comprising:

a dielectric flex tape substrate having a first tape surface, a second tape surface, an end, a plurality of tape terminal pads on the first tape surface near the end of the tape substrate, and a plurality of traces, each trace electrically connecting to a respective one of the terminal pads;

a semiconductor die having a pixel array, a first die surface, a second die surface, an edge, and a plurality of die attach pads on the first die surface adjacent the edge, the semiconductor die being attached to and overlapping the end of the tape substrate and having electrical connections between die attach pads and respective tape terminal pads; and

a lens structure disposed over the pixel array.

31. The imaging apparatus of claim 30, further comprising a cover glass disposed between the lens structure and the pixel array.

32. The imaging apparatus of claim 30, wherein the pixel array includes CMOS pixels.

33. The imaging apparatus of claim 30, wherein the pixel array includes CCD pixels.

34. The imaging apparatus of claim 30, wherein said electrical connections are formed by wire bonds.

35. The imaging apparatus of claim 30, wherein said electrical connections are formed by solder bumps.

36. The imaging apparatus of claim 30, further comprising an infrared lens formed over said semiconductor die.

37. A method of forming a semiconductor die package, said method comprising the acts of:

providing a semiconductor die having a first die surface, a second die surface, an edge, and a plurality of die attach pads on the first die surface adjacent the edge;

attaching a dielectric flex tape substrate having a first tape surface, a second tape surface, an end, a plurality of tape terminal pads on the first tape surface, and a plurality of traces, each trace electrically connecting to a respective one of the tape terminal pads on the first tape surface of the tape substrate to the semiconductor die; and

forming electrical connections between the die attach pads adjacent the edge of the die and respective tape terminal pads on the first tape surface of the tape substrate.

38. The method of forming a semiconductor module according to claim 37, wherein the tape substrate is attached to the first surface of the semiconductor die.

39. The method of forming a semiconductor module according to claim 38, wherein the electrical connections are formed by solder bumps.

40. The method of forming a semiconductor module according to claim 37, wherein the tape substrate is attached to the second surface of the semiconductor die.

41. The method of forming a semiconductor module according to claim 40, wherein the electrical connections are formed by wire bonds.

42. The method of forming a semiconductor module according to claim 37, wherein the semiconductor die includes an array of pixels.

43. The method of forming a semiconductor module according to claim 42, further comprising disposing a lens structure over the array of pixels.

44. The method of forming a semiconductor module according to claim 43, wherein the lens structure is disposed on the array of pixels.

45. The method of forming a semiconductor module according to claim 42, wherein the pixel array includes CMOS pixels.

46. The method of forming a semiconductor module according to claim 42, wherein the pixel array includes CCD pixels.

47. The method of forming a semiconductor module according to claim 42, further comprising installing a cover glass over the pixel array.

48. The method of forming a semiconductor module according to claim 47, wherein the cover glass is an infrared cut filter.

49. The method of forming a semiconductor module according to claim 47, wherein the cover glass is adhered directly to the die.

50. The method of forming a semiconductor module according to claim 47, further comprising disposing a lens structure over the cover glass.

51. The method of forming a semiconductor module according to claim 47, further comprising disposing a lens holder over the cover glass.

52. The method of forming a semiconductor module according to claim 51, wherein the lens holder is disposed on the cover glass.

53. The method of forming a semiconductor module according to claim 37, further comprising disposing a lens holder on the pixel array.

54. The method of forming a semiconductor module according to claim 37, further comprising applying an encapsulant to the electrical connections between the die attach pads adjacent the edge of the die and the respective tape terminal pads on the first tape surface near the end of the tape substrate.

55. The method of forming a semiconductor module according to claim 37, wherein the tape substrate partially overlaps the first die surface.